A NEW SPECIES AND NEW SYNONYM IN THE *HYPOGASTRURA* (S. STR.) *NIVICOLA* GROUP (COLLEMBOLA: HYPOGASTRURIDAE)[1]

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ABSTRACT: Springtails of the *Hypogastrura* (s. str.) *nivicola* group are cyclomorphic species more commonly known as snowfleas. Recent study of the Indiana species of *Hypogastrura* (s. str.) has resulted in the discovery of a new species, *H. simsi* n. sp. and a new synonym within the *H. nivicola* group. The new species is closely related to the palearctic *H. lapponica* but is distinct from that species on the basis of its size, lack of clavate body setae. differences in the mucro/dens ratios, and color differences. *Hypogastrura simsi* will key to *H. tooliki* in the most recent keys to the species of Nearctic *Hypogastrura* but clearly differs by its diminutive size at maturity, elongation of the dentes beyond the distal apex of the mucro, and PAO:eye ratio as well as other characters. Summer and winter morph forms are described for *H. simsi. Hypogastrura indiana,* is identified as a junior subjective synonym of *H. harveyi,* New Synonym, based on morphological similarities and on observed transformation between the two forms.

The present division of the genus *Hypogastrura* (s. str.) into distinct species groupings (Yosii, 1960, 1962; Christiansen and Bellinger, 1980, 1992) is at best difficult (however, also see Fjellberg, 1980, 1984, 1985). Eight species of this subgenus have been collected in Indiana. These eight species may be placed into three of five groups defined previously by Christiansen and Bellinger (1980, 1992) as follows: ***Nivicola*** group – cyclomorphic species that have both a summer and winter form. The winter form possesses thorn-like tubercles on the dentes. All species possess a single, strong, clavate tenent hair in the lower or 1-row (Yosii, 1962) of each tibiotarsus and 4+4 tenacular teeth. Five species of the *nivicola* group were studied in Indiana : *H. nivicola* (Fitch), 1847; *H. packardi* (Folsom), 1902 (= *H. notha* (MacNamara), 1922, winter form of *packardi,* see Waltz and Hart, 1985); *H. harveyi* (Folsom), 1902 (= *Hypogastrura indiana* Christiansen and Bellinger, 1980, summer form of *harveyi,* see below); *H. sparta* Christiansen and Bellinger, 1980, known only as a summer form; and *H. simsi* n. sp. ***Viatica*** group – species with multiple tenent hairs and 3+3 tenacular teeth. One species of the *viatica* group is known in Indiana : *H. distincta* (Axelson), 1902. ***Manubrialis*** group – species with a single tenent hair not as strong as in the *nivicola* group, and 4+4 tenacular teeth. Two species of the *manubrialis* group are known in Indiana: *H. manubrialis* (Tullberg), 1869; and *H. assimilis* (Krausbauer), 1898, (= *H. pannosa* (MacNamara), 1922, Babenko, in litt; = *H. essa* Christiansen and Bellinger, 1980, see Fjellberg, 1985).

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Hypogastrura indiana is distinct among included species of the *packardi* group (sensu Christiansen and Bellinger) because of the large number of lateral setae of the ventral tube (8+8 or more). It is among the species characterized by the possession of 1+1 setae in the area verticalis including *H. copiosa* (Folsom), *H. funesta* Christiansen and Bellinger, and *H. madera* Christiansen and Bellinger.

Within the *nivicola* group (sensu Christiansen and Bellinger), *H. harveyi,* like *H. indiana* above, is distinct among the included species on the basis of the large number of lateral setae of the ventral tube (11+11 or 13+13). Only *H. harveyi* and *H. nivicola* possess an area verticalis of 1+1 within the *nivicola* group.

Based on the morphological similarities of *H. indiana* and *H. harveyi* we investigated the possibility that these were summer and winter forms of the same species. Specimens transforming from *H. harveyi* to *H. indiana* were identified and compared to the type of *H. indiana.* We herein place *H. indiana* Christiansen and Bellinger, 1980, as a junior subjective synonym of *H. harveyi* (Folsom), 1902, NEW SYNONYM.

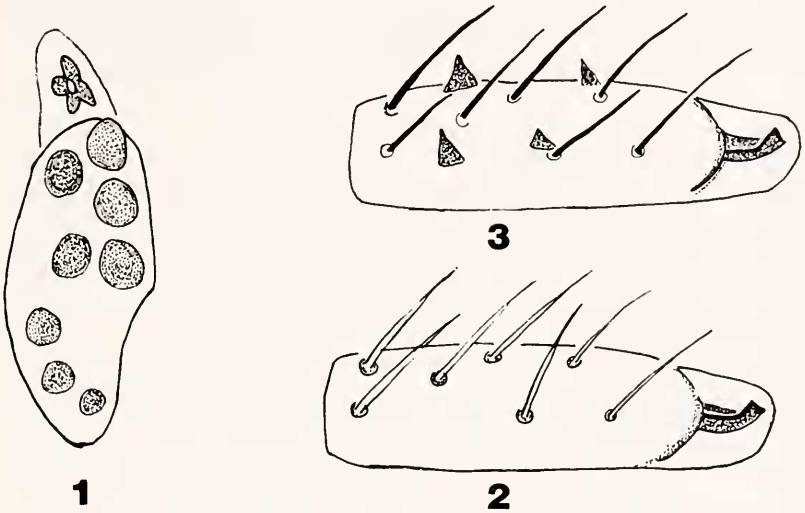
Below we describe a new species of the *nivicola* group.

Hypogastrura (s. str.) *simsi* NEW SPECIES

Description. Color: light, yellowish brown. Size: largest individual less than 1.0 mm in length. Head: Antennal segment IV with apical bulb elongate and simple; six dorsal blunt setae. No ventral file. Normal antennal III organ present. PAO (Fig. 1) subequal in diameter to nearest eye. Eyes (Fig. 1) 8X8 with seven eyes subequal to the others and one eye slightly smaller. Area verticalis setae, 2+2. Maxilla typical of the subgenus, strong and hook-like. Sublobal setae of outer lobe, 2. **Body:** Body granulations coarse. Ungues with small tooth approximately one-third from apex. Tenent hair of 1 row well developed and weakly clavate. Ventral tube with 4+4 lateral setae. Tenacular teeth 4+4. Seta m1 present on abdominal IV. Largest setae of Abd. V and VI acuminate, only slightly longer than other body setae and minutely, unilaterally serrate. Small anal spines on well defined papillae; spines subequal in length to length of papillae.

Furcula: Dentes of summer form (Fig. 2) with fine granulations dorsally, approximately 10x length of mucro and extending beyond distal end of mucro as a large, lateral projection; with seven dorsal setae. Dentes of winter form (Fig. 3) with fine granulations dorsally, and with three or four triangulate tubercules, of which one is typically more sharply pointed than the others, dentes approximately 7x length of mucro and extending beyond distal end of mucro as in summer form, and seven dorsal setae.

Material. All types were collected from the Hart Farm located: Indiana: Wayne Co., Washington Twp., near Milton, SW 1/4 Sec. 33, T16N, R19E. (Slidemounted type material). HOLOTYPE: In: Wayne Co., Milton, Hart Farm, 27-II-1985, male (winter form), slidemounted (Marc Andre:water sol), deposited USNM. PARATYPES. 22-III-1981, female (summer form), slidemounted (Marc Andre:water sol.); 10-IV-1985, female (summer form with winter exuviae), slidemounted (Marc Andre:water sol.); 8-IV-1985, female (summer form), slidemounted (Marc Andre:water sol.); 26-III-1985, female (summer form), slidemounted (Marc Andre:water sol.); 25-I-1980, (winter form), slidemounted (Marc Andre:water sol.); 30-I-1982, (winter form), slidemounted (Marc Andre:water sol.); 13-II-1983, male (summer form), slidemounted (Marc Andre:water sol.); 22-



Figures 1-3. *Hypogastrura simsi* n.sp. 1. Eye patch and PAO. 2. Dentes (summer form). 3. Dentes (winter form).

III-1981, male (summer form), slidemounted (Marc Andre:water sol.); 9-III-1983, female (summer form), slidemounted (Marc Andre:water sol.); 25-I-1980, male (winter form), slidemounted (Marc Andre:water sol.); 6-IV-1985, female (summer form), slidemounted (Marc Andre:water sol.); 10-IV-1985, male (summer form – molting) slidemounted (Marc Andre:water sol.); 10-IV-1985, slidemounted (Marc Andre:water sol.); 10-IV-1985, slidemounted (Marc Andre:water sol.); 10-IV-1985, slidemounted (Marc Andre:water sol.); 10-IV-1985, slidemounted (Marc Andre:water sol.); 10-IV-1985, slidemounted (Marc Andre:water sol.); 30-I-1982, female (winter form), slidemounted (Marc Andre:water sol.); 25-I-1980, male (winter form), slidemounted (Marc Andre:water sol.); 22-III-1981, 3 males (winter and summer forms), slidemounted (Gisin's medium:water sol.). (Fluid/Alcohol preserved type material). 6-IV-1985, 2 specimens; 8-IV-1985, 12 specimens; 8-IV-1985, 10 specimens; 10-IV-1985, 5 specimens; 10-IV-1985, 16 specimens. Paratypes are deposited at Purdue University, West Lafayette, IN; Illinois Natural History Survey, Champaign; and the US National Museum, Washington, D.C.

Etymology. simsi – possessive patronymic epithet of Robert and Opal Sims, to whom this species is dedicated, who purchased the land on which this species was discovered and studied, and who are relatives (in-laws) of J.W. Hart.

Diagnosis. *Hypogastrura simsi* is smaller (< 1mm in length at maturity) than any described Nearctic species of the *nivicola* group and is easily differentiated from *H. tooliki* to which it most readily keys by the shape of the mucro, the unusual extension of the dens beyond the tip of the mucro, and the PAO:nearest eye ratio. This new species is apparently most closely related to the palearctic species *H. lapponica* (Axelson), 1902, (see Gisin, 1960, Fjell-

berg, 1980, Leinaas, 1981a) from which *H. simsi* differs by the absence of clavate body setae on the tibiotarsi and abdominal segments, differences in body color, and *H. simsi* is distinctly smaller than *H. lapponica.*

BIOLOGY

Hypogastrura simsi shares a similar biology with previously reported Nearctic (Folsom, 1902) and European (Lienaas, 1981a, b) species of this group. Leinaas (1981a) provided detailed information on the biology of *H. lapponica* most of which is easily applied to our (JWH) observations of *H. simsi.* However, our data differs significantly from that reported by Leinaas (1981a) in that both summer and winter forms of *H. simsi* are known from the subcortical habitat. Summer and winter morph forms have been collected from beneath the bark of felled red mulberry (*Morus rubra*), ash (*Fraxinus* sp.), and American beech (*Fagus grandifolia*). Rarely have specimens been collected outside the subcortical habitat, possibly indicating a strong behavioral preference for the subcortical habitat. Specimens molting from the winter form to the summer form are known from a range of dates beginning in late February (II-27) to early April (IV-10).

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